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On the genus Lindbladia.

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The genus Lindbladia of the Myxomycetes, is represented by a single species only. This species, *Lindbladia effusa* (Ehr.) Rost., has a wide range in the United States, having been found in one or the other of its forms in several of the middle and western states. The genus and species have been described by Rostafinski as follows:

LINDBLADIA Fr.—Æthalium naked, composed of numerous irregularly polygonal, minute sporangia with the walls grown together; surface to the extremities of the sporangia warted. —Rtfki. Mon. 223.

LINDBLADIA EFFUSA (Ehr.) Rostfki.—Æthalium naked, seated on a common, strongly developed hypothallus; cortex when prematurely dessiccated black, thick, brown, lustrous, with the surface rough; mass of spores brown-ocher or umber; spores bright colored, smooth .0058–.0072 mm. diam.—Rtfki. Mon. 223. Cooke, Myxomycetes of Great Britain.

Unfortunately the brief diagnostic description of Rostafinski as given above, and also in the *Sylloge Fungorum* of Saccardo, only covers in reality a comparatively small portion of the forms which are legitimately included within the limits of the species. The explanatory notes, however, which accompany this diagnosis in the *Monografia Sluzowce*, give a supplementary description of the more complex æthalioid forms, to which belong a large portion of the American specimens of Lindbladia, and also such European specimens as I have had the opportunity of examining.

An analysis of all American specimens will show a surprisingly varied series of forms, all of which may be properly classed under the one species. Although these are different in their external appearance, they possess the same morphological details.

In addition to the true æthalioid forms described by Rostafinski and others, a form with simple sometimes substipitate sporangia is found in all sections of the northern United States, which, for many reasons, is worthy of varietal distinction. It may be described as follows:

Var. **simplex** var. nov.—Sporangia simple, gregarious, either free and separate or crowded and touching each other but with the walls not grown together; standing in effused clusters on a common hypothallus; elongated ellipsoidal in shape or distorted by crowding; usually either sessile with a narrow base, or substipitate attached to the hypothallus by a black plasmodic point of attachment, or occasionally stipitate with well marked short brown-black rugose stipes; entire sporangia averaging one mm. in height. Sporangium walls simple, sometimes lustrous, often having a few longitudinal folds in their lower half, pale umber colored, roughened externally by being thickly studded with rounded dark-brown plasmodic granules; spores in mass pale umber colored, from 5.5—7.5μ in diameter, with thin epispores very delicately warted but apparently smooth under lenses of medium power.—*Perichæna cæspitosa* Pk.; no. 2,700 N. Am. Fungi, E. & E.

Common in the northern and western states. Stipitate form found in Shawangunk Mts., N. Y.

The occurence of stipes in this variety of the species, which has hitherto been described as æthalioid only in character, is a point of great interest.

Undoubtedly, the extreme forms of the species are apparently very diverse, there being a great range between the simple variety above described and the thick effused æthalia often found, although the area of hypothallus covered by the sporangia is as great in one case as in the other.

The morphological characters common to all these forms, however, are so positive that it is not possible to separate even the extremes by a valid specific distinction.

The æthalia vary greatly in thickness and structure, and may have either a naked or corticate surface. The simplest form of æthalium is composed of irregular or polygonal sporangia, standing in a single rank on a common hypothallus, with the lateral walls grown together, the upper surface being roughened with the dark brown plasmodic granules. These simple æthalia grade into other and more complex forms of æthalia, which grow in effused or sometimes hemispherical

patches often three quarters of an inch thick, and in the first case many square inches in diameter. They are formed of entangled or interwoven masses of elongated or branched sporangia with the walls grown together.

Some of these æthalia have the upper surface irregular and naked, formed simply of the convex apices of the component sporangia. Others have a nearly plane upper surface composed of a thick cortex, developed from and upon the apices and external portions of the sporangia. The special character of the æthalia, whether naked or corticate, seems to be determined by environment or by conditions affecting the plasmodium during its differentiation into sporangia. It is not in any degree dependent upon the size of the mature æthalium, for I have seen both of these forms of the maximum thickness attained by the species.

The spores of all forms, simple and æthalioid, are identical, being delicately warted under high power lenses. The hypothallus of all forms and the cortex of the corticate æthalia are composed of thick plasmodic membranes containing irregular particles of plasmodic refuse.

The hypothallus has an irregular laminated structure, composed of a varying number of thin membranous layers. In the simple variety it is a nearly uniform membrane being at most composed of but two or three layers. In the æthalia however the layers are numerous, not closely touching each other at all points, but separated at intervals, leaving sometimes quite large and wide interspaces which give the hypothalli a loose open structure. In the hemispherical æthalia it may form a sponge-like expansion of one-quarter to one-half an inch in thickness, upon which the branched and interwoven sporangia are erected.

The plasmodic colored granules which are found in the sporangium walls of all specimens of Lindbladia, are exceedingly interesting when examined under a high power lens, and are worthy of careful study. The exterior walls of both the simple variety and the naked æthalia, are thickly studded with these granules which are deeply colored with a violet-brown pigment. They are irregularly spheroidal in shape, averaging about 1.15 μ in diameter. They are composed of a plasmodic investing membrane continuous with the wall of the sporangium, which encloses a rounded nuclear mass also plasmodic in structure, but of a different density and refractive quality.

They project outwardly from the sporangium wall and are attached to its outer surface so slightly as to be readily broken off, leaving a ring-like base, thus giving the membrane of the wall the appearance of being covered with minute elevated annular markings or sculpturings.

Plasmodic granules similar in structure, but flattened and unpigmented, having been modified by their conditions, are found imbedded in the septa or dividing walls between the component sporangia of all the æthalioid forms, corticate as well as naked.

The various reagents which may be used in the preparation of the sporangium wall for microscopic examination, as for instance, alcohol and acidulated water, or the glycerine media used for permanent slide-mounts, will also develop the same annular markings, by softening and disintegrating the thin investing pellicle of the granules, thus freeing the denser nuclei which are comparatively unaffected by the reagents. This fact suggests the possibility of error in conclusions drawn from examinations made from mounted material only.

The natural relations of closely allied genera to each other will always prove an interesting and profitable subject for study, and the relations of Lindbladia and Tubulina, both genera belonging to the same order, LICEACEÆ, will serve as a striking illustration of this point.

The genus *Tubulina* shows an analogous and nearly parallel course of development to Lindbladia, in a series of forms also beginning with simple, separate, aggregated sporangia on a common hypothallus, and extending through various similar æthalioid forms; always however having the sporangia in a single rank, and finally even developing in some instances a partial cortex. At one point of the parallel development of the two series, the analogy is so great that the corresponding forms, if considered by themselves, would be properly classed as species of the same genus, the generic characters being so similar.

Yet Lindbladia, especially through its simple variety, more nearly resembles in some important structural characters the order HETERODERMEÆ through its genus *Cribraria*, than it does the analogous genus Tubulina of its own order.

These special points of correspondence are first, the existence of plasmodic colored granules throughout the whole

genus Cribraria (in common with the rest of the Heterodermeæ), similar in construction to those of Lindbladia except that they are permanent and not evanescent under the conditions above detailed; second, the similarity of the sporangia of at least one species, *Cribraria argillacea*, with its practically permanent wall, to those of the stipitate and substipitate forms of Lindbladia effusa var. simplex.

It is, therefore, a legitimate inference, that Lindbladia and Tubulina, although they closely approach each other, having been similarly developed along parallel ordinal and partially parallel generic lines, probably arose from independent and perhaps widely separated points of origin.

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The tendrils of Passiflora caerulea.

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(WITH PLATE XIV.)

I. Morphology and anatomy.

The work recorded in this first paper was undertaken for the purpose of determining the factors in the movements of the tendrils of the Passifloræ, more particularly the movements by which a tendril responds to a stimulus, resumes its original position, or on continuance of the irritation coils permanently, and its subsequent changes while coiled and serving as a support for the weight of the adjacent part of the plant body.

Accepting as entirely tenable the view that the other movements of the tendril are the results of conditions of growth and varying states of turgescence, they will be considered only in so far as they affect the coiling of the organ. With this end in view, attention will be directed to the arrangement of the tissue systems, their relative mechanical value as determined by the structure of the individual cells composing them, the continuity of the protoplasm between cells of similar and dissimilar tissues with reference to the irritability and power of conducting impulse of the parts concerned, and to the physiological changes induced in the motile cells by the stimuli to which this organ responds.